



UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE
United States Patent and Trademark Office
Address: COMMISSIONER FOR PATENTS
P.O. Box 1450
Alexandria, Virginia 22313-1450
www.uspto.gov

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
-----------------	-------------	----------------------	---------------------	------------------

10/695,798

10/30/2003

Atsushi Hiraiwa

XA-9967

7336

181

7590

03/10/2006

MILES & STOCKBRIDGE PC
1751 PINNACLE DRIVE
SUITE 500
MCLEAN, VA 22102-3833

EXAMINER

EVERHART, CARIDAD

ART UNIT

PAPER NUMBER

2891

DATE MAILED: 03/10/2006

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary	Application No. 10/695,798	Applicant(s) HIRAIWA ET AL.	
	Examiner Caridad M. Everhart	Art Unit 2891	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 20 December 2005.
- 2a) ☒ This action is **FINAL**. 2b) ☐ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-18 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 1-18 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on _____ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☒ All b) ☐ Some * c) ☐ None of:
1. ☒ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. _____.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
- * See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- | | |
|--|---|
| 1) <input checked="" type="checkbox"/> Notice of References Cited (PTO-892) | 4) <input type="checkbox"/> Interview Summary (PTO-413)
Paper No(s)/Mail Date. _____ |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948) | 5) <input type="checkbox"/> Notice of Informal Patent Application (PTO-152) |
| 3) <input type="checkbox"/> Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08)
Paper No(s)/Mail Date _____ | 6) <input type="checkbox"/> Other: _____ |

Response to Arguments

Applicant's arguments with respect to claims 1-18 have been considered but are moot in view of the new ground(s) of rejection.

Applicant has amended to include the limitation "after said step (a)" and "such that constituent atoms ...are rearranged...".

Claim Rejections - 35 USC § 102

The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless --

(e) the invention was described in (1) an application for patent, published under section 122(b), by another filed in the United States before the invention by the applicant for patent or (2) a patent granted on an application for patent by another filed in the United States before the invention by the applicant for patent, except that an international application filed under the treaty defined in section 351(a) shall have the effects for purposes of this subsection of an application filed in the United States only if the international application designated the United States and was published under Article 21(2) of such treaty in the English language.

Claims 1, and 9-16 are rejected under 35 U.S.C. 102(e) as being anticipated by Ohmi, et al. (US 2002/0040847A1).

Ohmi, et al discloses the steps of forming a silicon oxide layer over silicon nitride and silicon oxide layers, and treating the silicon oxide layer with an oxygen plasma(paragraphs 0018, 0228, and 0241). The oxygen plasma treatment is carried out after the CVD deposition, and Ohmi, et al discloses that there is rearrangement of the constituent atoms(paragraphs 0222, 0228, and 0241). The process is carried out in a plasma chamber (paragraph 0047).

Ohmi, et al disclose the steps of forming relatively thin oxide layers for gate oxide layers(paragraph 0005), the formation of relatively thick oxide films for isolation including trench isolation structures(paragraph 0202), the patterning of the oxide layers(paragraph 0212, for example describes one of the insulation films being removed from certain areas of the substrate). Ohmi et al also describe a plasma treatment of these insulator films(paragraph 0026) with a plasma of oxygen and krypton. Ohmi, et al further teach the formation of memory devices(paragraph 0002). Ohmi, et al teach the benefits of the treatment step, such as low leakage current(paragraph 0003).

Claim Rejections - 35 USC § 103

The text of those sections of Title 35, U.S. Code not included in this action can be found in a prior Office action.

Claims 2-8 are rejected under 35 U.S.C. 103(a) as being unpatentable over Ohmi, et al as applied to claim 1 above, and further in view of Kim, et al. (US 6,391,803B1).

Ohmi, et al is silent with respect to the flow rate of the oxygen in the inert gas and with respect to the thickness of oxide formed relative to thickness of oxide formed by CVD and with respect to higher temperature and the step of forming the oxide by ALD.

Kim et al disclose the steps of depositing by atomic layer deposition a layer of silicon oxide (col. 5, lines 52-60). The deposition is by the method of exposing the surface to a precursor and of treating the precursor layer with an oxygen plasma (col. 5, lines 40-43 and 54-56). There is any oxygen plasma treatment, because after the oxide layer forms, the oxygen plasma to which the surface is exposed, and which surface now has an oxide coating, is now being treated with the oxygen plasma. The atmosphere may contain water (col. 5, lines 54-55). The pressure is within the recited range (col. 4, lines 11-14).

It would have been obvious to one of ordinary skill in the art at the time of the invention to have combined the ALD taught by Kim et al and the including water taught by Kim et al in the process taught by Ohmi et al because With respect to ALD, Ohmi et al encompasses this step, because Ohmi et al teach that other oxides may be deposited by the ALD method (paragraph 0172). Therefore, it would have been obvious to one of ordinary skill in the art at the time of the invention to have used ALD to deposit the silicon oxide in the process taught by Ohmi, et al. in view of the teaching made by Kim, et al. It would have been obvious to one of ordinary skill in the art at the time of the invention to have used water in the process taught by Ohmi et al in view of the teaching made by Kim et al because Ohmi et al teach that it is conventional in the art to use water for oxidation (paragraph 0096).

With respect to the flow rate of oxygen relative to inert gas, it would have been obvious to one of ordinary skill in the art at the time of the invention to have flowed the

inert gas at a higher rate than the oxygen, because in the case of nitriding, this is the case as taught by Kim, et al (col. 4, lines 57-63).

With respect to the thickness of oxide grown, it would have been obvious to one of ordinary skill in the art at the time of the invention that this would increase with oxide treatment because it would be expected that the initial oxide grown would increase in thickness with the continued presence of oxygen plasma.

Therefore, it would have been obvious to one of ordinary skill in the art that the thickness of the oxide grown from the atomic layer deposition would have continued to increase.

With respect to the temperature, it would have been obvious to one of ordinary skill in the art at the time of the invention because this is a variable of the art, which one of ordinary skill in the art would have been able to determine.

Applicant's amendment necessitated the new ground(s) of rejection presented in this Office action. Accordingly, **THIS ACTION IS MADE FINAL**. See MPEP § 706.07(a). Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire **THREE MONTHS** from the mailing date of this action. In the event a first reply is filed within **TWO MONTHS** of the mailing date of this final action and the advisory action is not mailed until after the end of the **THREE-MONTH** shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any

Art Unit: 2891

extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the date of this final action.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Caridad M. Everhart whose telephone number is 571-272-1892. The examiner can normally be reached on Monday through Fridays 7:30-4:00.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, B. Baumeister can be reached on 571-272-1722. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

C. Everhart
CARIDAD EVERHART
PRIMARY EXAMINER

C. Everhart
3-5-2006